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OPERATION AND SERVICE MANUAL 1981

MODEL 4302B MANUAL CONTROL UNIT

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OPERATION AND SERVICE MANUAL

for

MODEL 4302B MANUAL CONTROL UNIT

June 1981

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INITIAL INSPECTION FOR DAMAGE

Upon unpacking the equipment, retain the shipping container and packing material until the equipment has been thoroughly inspected and it is ensured that reshipment is unnecessary. Perform the following initial inspection:

a. Carefully look at the outside of the shipping container for discoloration, stains, charring or other signs of exposure to excessive heat, moisture or liquid chemicals. Check for any physical damage to the shipping container, such as dents, snags, rips, crushed sections or areas, or similar signs of excessive shock or careless handling.

b. With the equipment, and any accessory package, removed from the shipping container, check each item against the packing list or items supplied list in Section 1. If any items are missing, contact the factory or the manufacturer's local representative.

c. Carefully inspect the equipment, looking for dents, deep scratches, broken, cracked or loose pushbuttons or knobs, and any other signs of physical abuse or careless handling.

If damage is found, forward an immediate request to the delivering carrier to perform an inspection and prepare a concealed-damage report. Do not destroy any packing material until it has been examined by an agent of the carrier. Concurrently, report the nature and extent of damage to Weinschel Engineering, giving equipment model and serial numbers, so that necessary action can be taken. Under U.S. shipping regulations, damage claims must be collected by the consignee; do not return the equipment to Weinschel Engineering until a claim for damages has been established.

CRITICAL OPERATING NOTE

CAUTION

Ensure that the fan on the rear of the Model 430 Mainframe is installed and operational when an RF Unit is used. Otherwise, serious damage may occur within the unit.

When a Model 4302B Manual Control Unit is installed in a Model 430 Mainframe, the fan on the rear of the 430 must be removed. The removal of the fan is necessary to gain access to the connectors and terminal board on the rear panel of the 4302B. Refer to Paragraph 2.2 of this Manual for Model 430 fan removal instructions.

CAUTION

The fan is not required when a Model 4302B is installed in the mainframe. However, when an RF Unit is installed, the fan must be connected or serious damage to the unit may result.

TABLE OF CONTENTS

Paragraph	Title	Page
	SECTION 1 GENERAL INFORMATION	
1.1	Introduction	1-1
1.2	Items Supplied	1-1
	SECTION 2 INSTALLATION	
2.1	Unpacking	2-1
2.2	Physical Configuration	2-1
2.2.1	Fan Removal	2-1
2.2.2	Mechanical Interface	2-2
2.3	Cable Configuration	2-2
2.4	Operating Temperature Range	2-5
2.5	Repacking for Shipment	2-5
	SECTION 3 OPERATING INSTRUCTIONS	
3.1	Introduction	3-1
3.2	Front & Rear Panel Familiarization	3-1
3.2.1	Front Panel	3-1
3.2.2	Rear Panel	3-1
	SECTION 4 PRINCIPLES OF OPERATION	
4.1	Introduction	4-1
4.2	Block Diagram Description	4-1
4.3	Remote-Local Band Selection	4-3
4.4	Preset M1 Function	4-3
	SECTION 5 MAINTENANCE	
5.1	Introduction	5-1
5.2	Required Test Equipment	5-1
5.3	Performance Tests	5-1
5.3.1	Local Switching Mode	5-1
5.3.2	Remote Switching Mode	5-3
5.3.3	Preset M1 Control	5-4
	SECTION 6 REPLACEABLE PARTS	
6.1	Introduction	6-1
6.2	Ordering Information	6-1
6.3	Parts List	6-1
6.4	Manufacturer Codes	6-1
	SECTION 7 SCHEMATIC DIAGRAMS	
7.1	Introduction	7-1
7.2	List of Figures	7-1
	APPENDIX A. CODE LIST OF MANUFACTURERS	A-1

LIST OF ILLUSTRATIONS

Figure	Title	Page
1-1	Manual Multiband Sweep Oscillator System	1-0
2-1	Rear Panel Cabling Diagram, 4302B in a Manual Multiband System with Model 430A or B (including 08 Option)	2-3
2-2	Rear Panel Cabling Diagram, 4302B in a Manual Multiband System with Model 430C (including 09 Option)	2-4
3-1	Front Panel Descriptions	3-2
3-2	Rear Panel Descriptions	3-3
4-1	Block Diagram, Model 4302B Manual Control Unit	4-2
4-2	Preset M1, Simplified Schematic	4-5
6-1	Model 4302B, Basic Chassis Assembly	6-2
6-2	Assembly A1, Component Location	6-4
7-1	P1 Connections to Model 430 Mainframe	7-2
7-2	Model 4302B, Overall Schematic Diagram	7-3

LIST OF TABLES

Number	Title	Page
1-1	Specifications	1-2
2-1	Cable Assembly #3 Terminal Assignment	2-2
5-1	Local Mode Switching Voltages	5-2
5-2	Remote Mode Switching Voltages	5-3
6-1	Basic Chassis Assembly, Parts List	6-3
6-2	Assembly A1, Control Logic Board Parts List	6-5

Figure 1-1. Manual Multiband Sweep Oscillator System

SECTION 1
GENERAL INFORMATION

1.1 INTRODUCTION

The Weinschel Engineering Model 4302B Manual Control Unit is a solid-state plug in device, which, when installed in a Model 430 Series Sweep Oscillator Mainframe, provides implementation of a Manual, Multiband Sweep Oscillator System, as depicted in Figure 1-1. The Model 4302B is designed to permit operation of up to eight selectable 430 Series RF Units from a single Model 430 Mainframe. The RF Units are housed in the Model 4301A RF Unit Holder (two per unit), providing complete RF Unit function capability. The Model 4302B is compatible with any variation of the 430 Series (430A, B or C) Sweep Oscillators and with all Weinschel test and measuring systems. Specifications for the Model 4302B are included in Table 1-1.

1.2 ITEMS SUPPLIED

The following items are supplied with the Model 4302B Manual Control Unit.

a. Interconnecting Cable (Cable Assembly #3)

b. Operation and Service Manual

TABLE 1-1. Specifications

INTERFACE:	The Model 4302B controls up to 8 RF Units mounted in Model 4301A RF Unit Holders. The 4302B plugs into a Model 430 Mainframe.
BAND SELECTION (MANUAL)	Front panel pushbutton selects one of 8 RF Units controlled by the 4302B.
BAND SELECTION: (REMOTE)	Standard TTL levels representing a logic "0" (low) and a logic "1" (high) are applied to the REMOTE PROGRAMMING INPUT connector J4 to activate the selected band, as follows:

J4 CONNECTOR E C B A	BAND SELECT	J5 DIGITAL OUTPUTS C D E F H J K B
0 0 0 0	AUX	0 0 0 0 0 0 0 0
0 0 0 1	1	1 0 0 0 0 0 0 0
0 0 1 0	2	0 1 0 0 0 0 0 0
0 0 1 1	3	0 0 1 0 0 0 0 0
0 1 0 0	4	0 0 0 1 0 0 0 0
0 1 0 1	5	0 0 0 0 1 0 0 0
0 1 1 0	6	0 0 0 0 0 1 0 0
1 0 0 0	7	0 0 0 0 0 0 1 0
1 0 0 1	8	0 0 0 0 0 0 0 1

PRESET M1:	Front Panel Switches and Controls allow Preset M1 Control for 430 SYM M1 and CW M1 Modes.
DIGITAL OUTPUTS:	The J5 connector provides digital outputs which indicate which band (RF Unit) is activated. These outputs, as shown above, are provided in both the Manual Band Select and Remote Band Select modes of operation. Also provided on the J5 connector is a digital ground on pin A.
TEMPERATURE RANGE	Operating +10 to +40°C Storage -40 to +75°C
POWER REQUIREMENTS:	All required AC and DC Power Supplied by Model 430 via J8/P1 connector.
DIMENSIONS:	2 7/8" (7.3 cm) high x 7 3/16" (18.3 cm) wide x 11" (27.9 cm) deep.
SHIPPING WEIGHT	Approximately 2.2 lbs. (1 kg).

NOTE

The Model 4302B is an expanded version of the 4302A. It is capable of controlling 2 additional bands and has the circuitry required to interface with the 437A Preset M1 control.

SECTION 2
INSTALLATION

2.1 UNPACKING

The Weinschel Engineering Model 4302B Manual Control Unit is shipped in a double carton with two inches of packing material between the inner and outer cartons. Use normal care when unpacking the instrument and removing the packing material. Do not destroy the cartons or packing material until the equipment is thoroughly inspected. If damage is found, notify the carrier immediately and do not destroy any packing material until an agent of the carrier has examined it. Under U.S. shipping regulations, damage claims must be collected by the consignee; do not return the instrument to Weinschel Engineering until a claim for damages has been established.

2.2 PHYSICAL CONFIGURATION

The Model 4302B is installed in the Model 430 Mainframe after removal of the 430 rear panel fan assembly.

2.2.1 Fan Removal

When a Model 4302B Manual Control Unit is installed in a Model 430 Mainframe, the fan on the rear of the 430 must be removed. The removal of the fan is necessary to gain access to the connectors and terminal board on the rear panel of the 4302B.

To remove the fan, proceed with the following steps:

a. Turn off power to the unit.

b. Disconnect fan plug (P14 on the 430A or B, P12 on the 430C). Some 430 units require removal of the top cover or the plug-in module to gain access to the fan plug.

c. Remove trim on left rear of unit (secured by two Phillips screws) and slide filler strips from side of unit.

d. Remove the two screws and two bolts securing the fan to the unit. Remove fan and retain for future use.

e. Replace, bolts, screws, filler strips and trim.

CAUTION

The fan is not required when a Model 4302B is installed in the mainframe. However, when an RF Unit is installed, the fan must be connected or serious damage to the unit may result.

2.2.2 Mechanical Interface

The Model 4302B is physically designed for location in the Model 430 Mainframe in the Front Panel aperture which is occupied by an RF Unit in a single band sweeper system. After removal of the RF Unit (if so equipped) and the fan (refer to paragraph 2.2.1 above), the Model 4302B may be slid into place to facilitate the P1 (4302B) to J8 (Model 430) connection. The unit is then securely locked in place via the captive screw connection to the mainframe.

2.3 CABLE CONFIGURATION

Cable connections for the 4302B portion of a Manual Multiband System are illustrated in Figures 2-1 and 2-2. Cable Assembly #1 is supplied with the Model 4301A RF Unit Holder; Cable Assembly #2 is supplied with a complete Manual Multiband System, and Cable Assembly #3 is furnished with the Model 4302B. The 08 and 09 Band Select Cables are provided with their respective 430 Series GPIB Programming Options.

Cable #1 may be connected to either J1 or J2 of the Model 4301A.

The configuration of Cable #2 is dependent upon the components and layout of the system. When constructing a Manual Multiband System around an existing Model 430, the user must supply a complete listing of all system components and their layout to facilitate proper configuration of the #2 Cable Assembly.

Cable #3 configuration is dependent upon the Model 430 (A,B or C) employed. The 430A and B employ a Terminal Board (TB1) for connection to TB1 of the 4302B, while the 430C uses a connector (J10) and slide switch (S2) to facilitate these connections. Table 2-1 provides Cable #3 terminal to terminal assignments for the Model 430A or B, and terminal to pin assignments for the Model 430C.

Band Select Cable configuration is dependent upon the Remote Programming Option (08 or 09) which the Model 430 employs. This cable is not present for Model 430 units not equipped with a GPIB Programming Option.

An additional cable (not shown) is required to implement the Power Programming function of Model 430 units equipped with Option 08 or 09. This cable connects directly to the RF Units and does not interface with the 4302B. However, it should be noted that the configuration of the Power Programming Cable Assembly is system dependent as with Cable Assembly #2 above.

TABLE 2-1. CABLE ASSEMBLY #3 TERMINAL ASSIGNMENT
Model 4302B to Model 430A, B or (C)

Cable Assembly #3	Terminal (pin) Numbers	
Wire Color Code	Model 430 TB1 (J10)	Model 4302B
Orange	11	8
Green	10	7
Brown	9	6
Yellow	8	5
Grey	7	4
Shield	6	NC

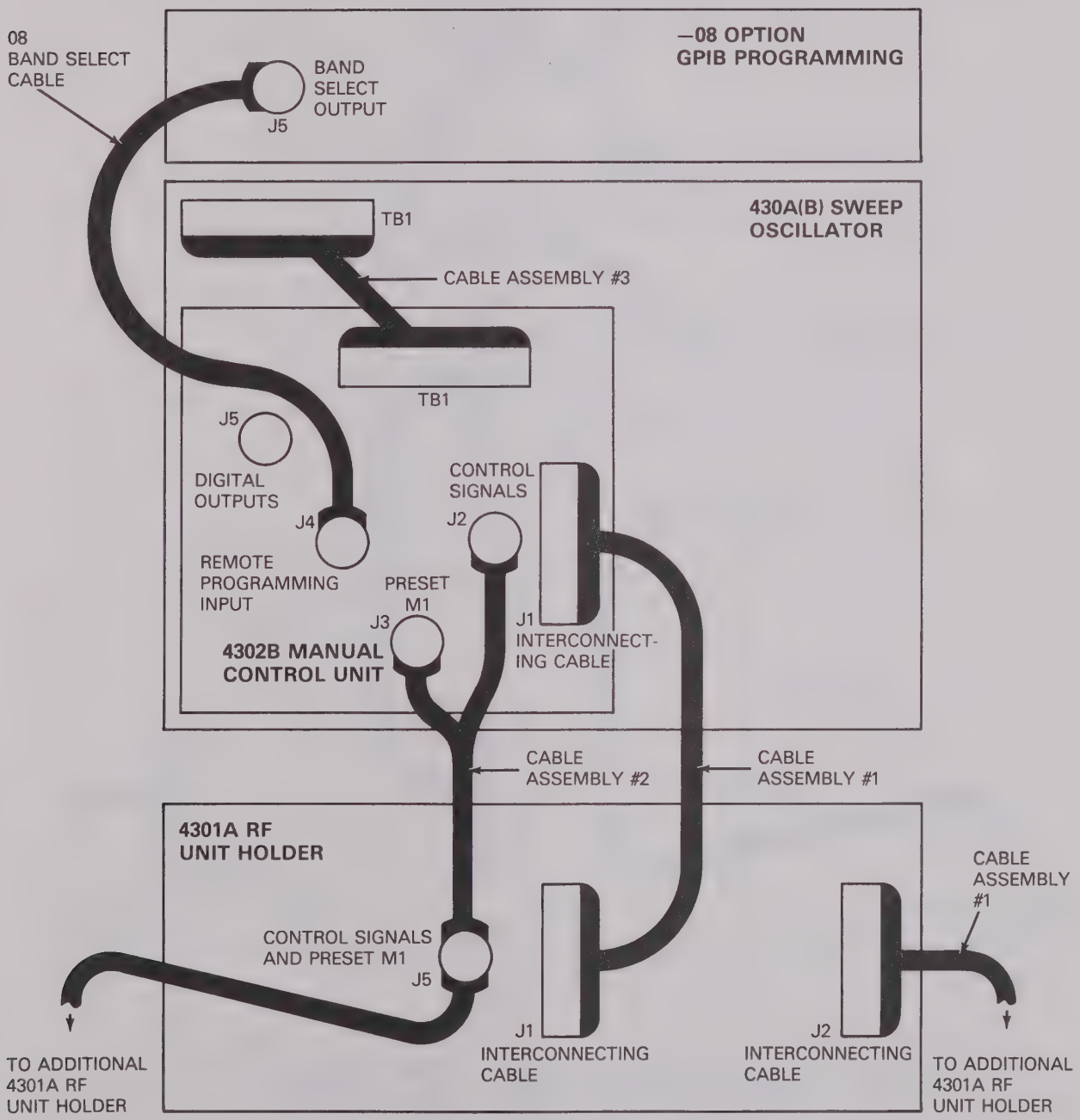


Figure 2-1 Rear Panel Cabling Diagram, 4302B in a Manual Multiband System with Model 430A or B (including 08 Option)

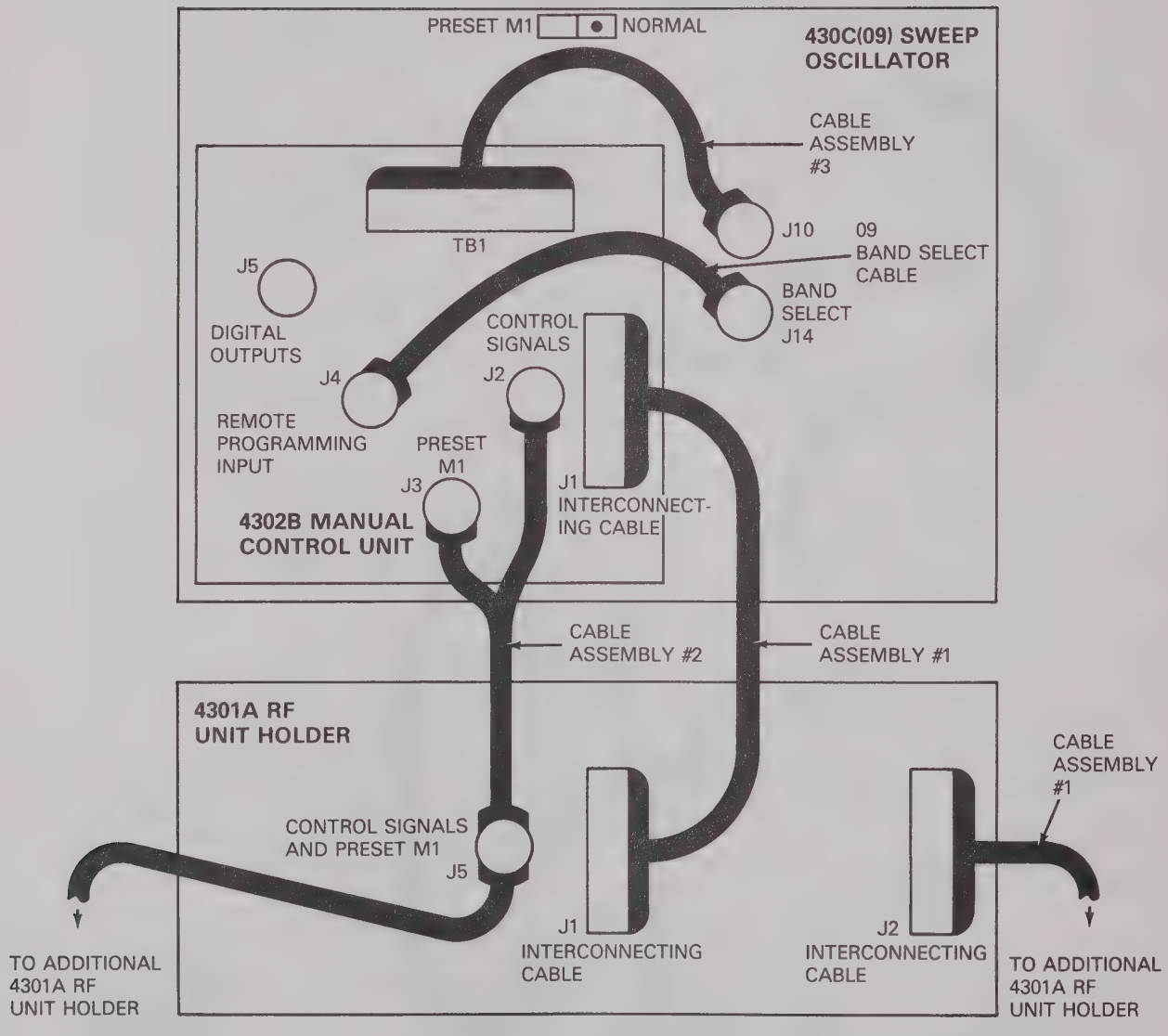


Figure 2-2 Rear Panel Cabling Diagram, 4302B in a Manual Multiband System with Model 430C (including 09 Option)

2.4 OPERATING TEMPERATURE RANGE

The Model 4302B is designed to operate within its specifications when the ambient temperature is between +10°C and +40°C. Operating in ambient temperatures beyond these limits could affect the accuracy of the instrument and cause damage to its circuits.

2.5 REPACKING FOR SHIPMENT

To protect the unit during reshipment always use the best packaging methods available. When possible, use the original packing containers and cushioning material. If the unit is to be shipped with a Model 430 Mainframe, insure that the Model 4302B is securely locked in position and held there by cushioning material. If the original packing materials are not available, use the following procedure:

a. Wrap instrument in sturdy paper or plastic.

b. Place wrapped instrument in a strong shipping container; use a 3/4-inch layer of shock absorbing material around all sides of the unit to provide a firm cushion and prevent movement inside the container.

c. Thoroughly seal shipping container and mark "FRAGILE".

d. If shipping for service, attach a tag to indicate:

   1. Service required.
   2. Description of malfunction.
   3. Model and Serial numbers.
   4. Return address
   5. Authorization to conduct repairs.

SECTION 3
OPERATING INSTRUCTIONS

3.1 INTRODUCTION

The Model 4302B facilitates implementation of a Manual Multiband System by providing control of, and interface with, an increased number of RF Units employed by a single sweeper system. It is designed to permit manual selection of RF Units from front panel pushbuttons, or to allow remote RF Unit Selection by means of a modified BCD code. When selected, an RF Unit operates as a single band unit in the same way as if it were installed directly into the Model 430 Mainframe.

3.2 FRONT AND REAR PANEL FAMILIARIZATION

3.2.1 FRONT PANEL

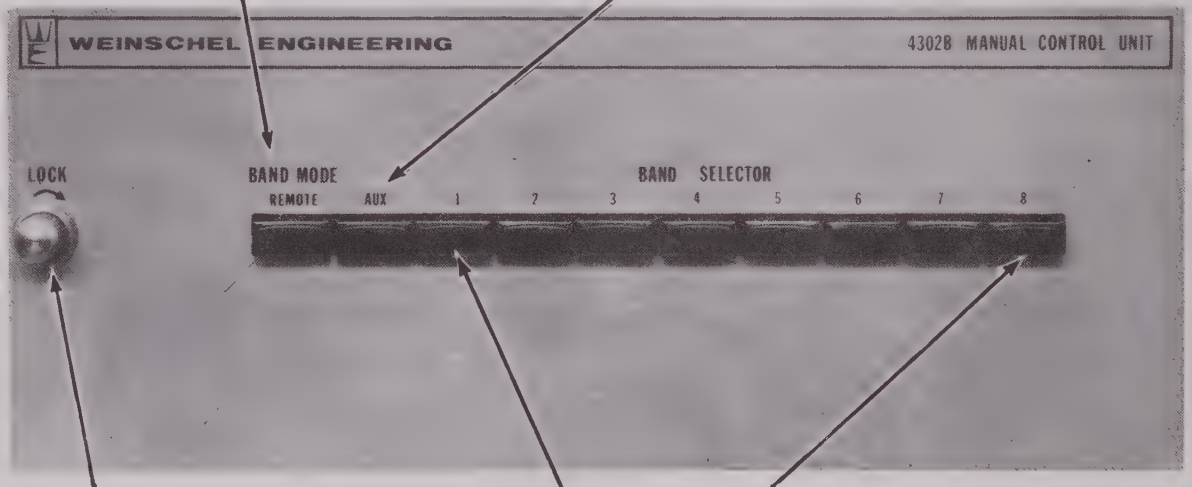
Figure 3-1 illustrates and identifies controls located on the Model 4302B front panel.

3.2.2 REAR PANEL

Figure 3-2 illustrates and identifies connectors located on the rear panel.

BAND MODE REMOTE: When depressed, J4 inputs at rear panel connector select RF Band to be operative. BAND SELECTOR pushbuttons are inoperative when BAND MODE REMOTE pushbutton is depressed.

AUX: When depressed, an auxiliary control signal available at TB1, pins 1 and 2, is actuated.



LOCK: Securely holds unit in 430 Mainframe.

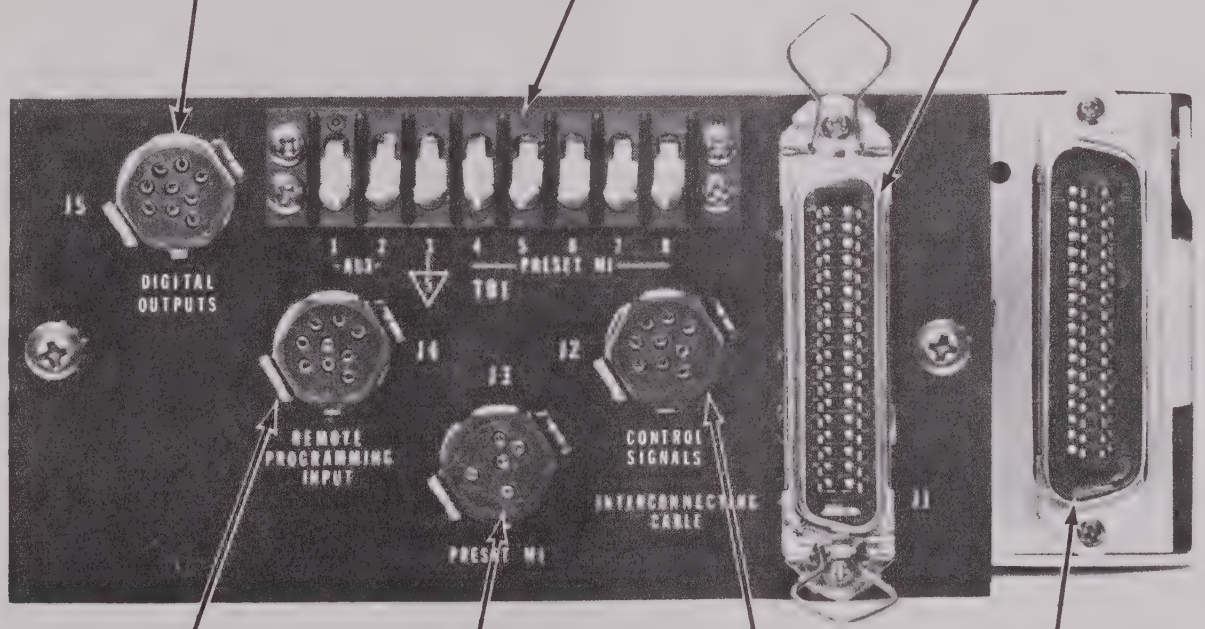
BAND SELECTOR: Pushbutton 1 through 8 actuate RF Units 1 through 8. Pushbuttons not operative when BAND MODE REMOTE pushbutton is depressed.

Figure 3-1. Front Panel Descriptions

J5-DIGITAL OUTPUTS: Provides digital outputs indicating which band (RF Unit) is activated. Refer to Table 1-1 for Band Select coding.

TB1: Terminals 1 and 2 (Auxiliary Control), 4 through 8 connect to Model 430 for Preset M1 operation.

J1-INTERCONNECTING CABLE: Pin to Pin connection to P1 provides power and signal interface between Model 430 and RF Unit via Model 4301A Circuitry.



J4-REMOTE PROGRAMMING INPUT: Accepts modified BCD input codes for remote selection of RF Units. Refer to Table 1-1 for Band Select coding.

J2-CONTROL SIGNALS: Provides signals for the Model 4301A required to implement selection of RF Units for operation.

J3-PRESET M1: Provides Preset M1 interface between the Model 430 and the Model 4301A.

P1-MAIN CHASSIS CONNECTOR: Connects to J8 of Model 430 Mainframe; provides power and interface with Sweep Oscillator circuitry.

Figure 3-2. Rear Panel Descriptions

SECTION 4
PRINCIPLES OF OPERATION

4.1 INTRODUCTION

The Model 4302B Manual Control Unit serves as an interface between the Model 430 Mainframe and the Model 4301A RF Unit Holders. This section describes the nature of the interconnections and explains the circuit details.

4.2 BLOCK DIAGRAM DESCRIPTION

The power and control signals distributed to the Model 4301A RF Unit Holder are shown in Figure 4-1. Cable Assembly #3 provides Preset-M1 Interface with the Model 430 Mainframe. Cable Assembly #1 transmits power and control signals to the Model 4301RF Unit Holder. Cable Assembly #2 provides RF Unit control signals to, and Preset-M1 Interface with, the Model 4301A.

The 36-conductor cable, from P1, is essentially routed through and out of the Model 4302B, except for lead #8, (which constitutes a control signal for the Preset M1 circuitry) and the +5V supply and ground from the 430. Refer to Figure 7-1 for P1 to J8 (Model 430) electrical interface.

A group of circuits labeled REMOTE-LOCAL Band Selection receives inputs from the front panel pushbuttons and the remote programming input, decodes them and transmits them (the band selection information) to the Model 4301A RF Unit Holder. This information is also routed through parallel buffers to Digital Output connector J5, for auxiliary monitoring/control purposes.

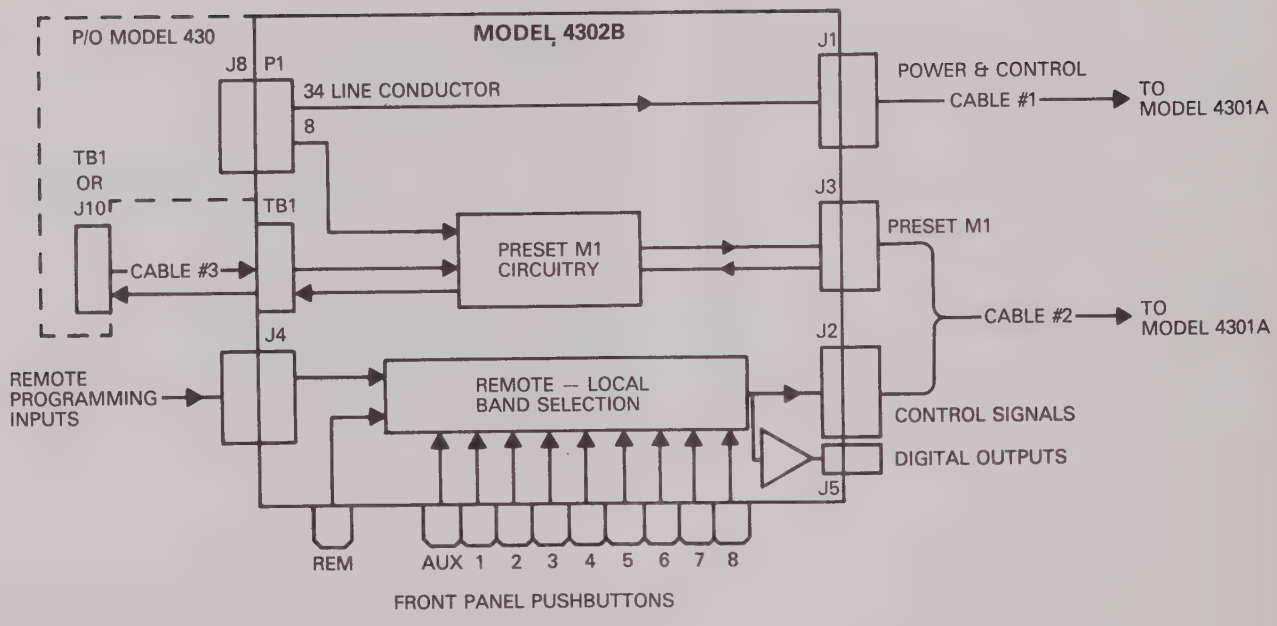


Figure 4-1. Block Diagram, Model 4302B Manual Control Unit

4.3 REMOTE-LOCAL BAND SELECTION

The local control mode is selected when the front-panel BAND MODE REMOTE pushbutton is not depressed. Refer to the schematic diagram, Figure 7-2. The Remote pushbutton is shown in the manual mode. In this condition, the tri-state inverters of U1 are enabled, while the tri-state buffers of U2 (remote lines) are disabled. When band select pushbutton 1 is depressed (as shown), the inverter input pin 2 of U1 is pulled low, producing a logic high at U1, output pin 3. The other band select inputs are pulled high, producing logic low outputs at U1, pins 5, 7 and 9. This presents the code 0001 to BCD-to-Decimal decoder U3. In response, U3 will drop output 1 (pin 2) low, while holding the others high. This causes transistor Q3 to turn on, applying the +5V emitter supply to input pin 2 of output buffer U4. The same logic high is supplied to pin A of control signal jack J2. This level is routed through Cable #2 to select the Band 1 RF Unit in the 4301A RF Unit Holder. For any selected band, one J2 line will be high, while all others are low. The same code is buffered and applied to Digital Output connector J5, for monitoring purposes.

When REMOTE pushbutton S1 is depressed, U1 is disabled while U2 is enabled. This permits the Remote Programming code at J4 to control the outputs of Decoder U3. The Remote Programming code is BCD except for 0111 (7), which is not used in the Manual Control unit because it signifies the Wideband Mode in a Multiplexed Multiband Sweeper System. Also notice that the wiring of the manual select pushbuttons to U1 reflects this same BCD modification, so the "7" output of decoder U3 (pin 9) is not used.

4.4 PRESET M1 FUNCTION

With the Sweep Function selector of the 430 Mainframe set in either the SYM M1 or CW M1 position, either the M1 control on the 430, or the Preset M1 control on a 4301A RF Unit Holder (or one of the three Preset M1 controls on the 437A RF Unit, if installed) is activated. Figure 4-2 is a simplified interconnect schematic showing how the Preset M1 function is implemented.

When SYM M1 or CW M1 is selected, +5V is applied to the coils at relays K1A and K1B, via P1-8 (from J8 of the Model 430). The other side of K1B is grounded through Q6 in the 4301A, when an A_x signal (band select control) is applied and one of the 4301A Presets is selected. Relay K1B contacts 15/1 and 14/4 close, thus completing the M1 path via R1 or R2 of the 4301A.

When a 437A RF Unit is installed and one of its three Presets is selected, one side of relay K1 of the 437 is grounded. The CW M1 or SYM M1 (+5V) from the 430 energizes this relay. An A_x signed to the 437A is then applied via the closed contacts of K1 (437A) energizing Q5 thus grounding the other side of the K1A coil in the 4302B. K1A Contacts 7/10 open and 7/9 close thus completing the M1 path through the selected 437A Preset M1 potentiometer.

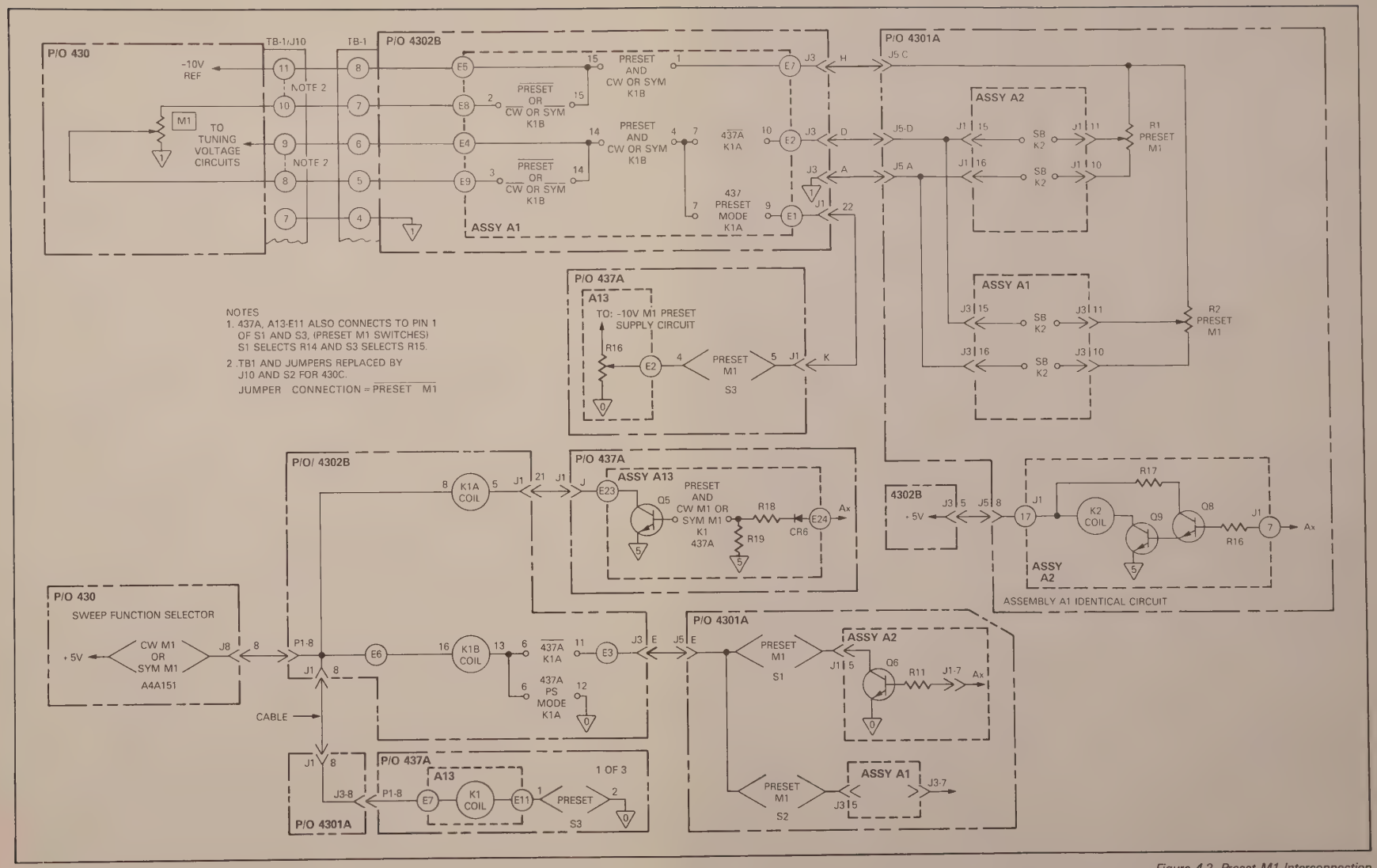


Figure 4-2. Preset M1 Interconnection Simplified Schematic

SECTION 5
MAINTENANCE

5.1 INTRODUCTION

This section provides the information required to maintain and service the Model 4302B Manual Control Unit including performance tests. No calibration or alignment is required for the Model 4302B.

5.2 REQUIRED TEST EQUIPMENT

A general purpose volt/ohm meter is the only piece of test equipment needed to completely check the Model 4302B.

5.3 PERFORMANCE TESTS

The following performance tests provide a method to verify whether the Model 4302B is operating within the specifications given in Table 1-1. The tests may be used as part of the incoming quality control inspection, as a periodic operational check or after maintenance or service has been performed.

5.3.1 LOCAL SWITCHING MODE

Insert the Model 4302B into the Model 430 Mainframe but do not connect any cables to the rear of the Model 4302B.

a. Solder a six-inch piece of hook-up wire to one side of a 4.7K, ±10%, 1/4 watt carbon composition resistor and connect the other end of the wire to pin 3 of TB1.

b. Apply main power to the Model 430 Mainframe and depress BAND SELECTOR 1 pushbutton on the Model 4302B.

c. Insert the free end of the 4.7K resistor into PIN A of the rear panel J2 connector on the Model 4302B.

d. Set the voltmeter for a reading of approximately +5 volts and connect it across the 4.7K resistor (+ to J2 connector side of resistor). The meter should indicate 5 (±1) volts.

e. Sequentially depress the remaining pushbuttons, except the BAND MODE REMOTE. The meter should indicate +5 (±1) volts only when the pushbutton corresponding to the appropriate J2 pin number being monitored is depressed (See Table 5-1). The meter should read zero at all other times.

f. Repeat this procedure with the 4.7K resistor inserted in J5 pin C.

g. Remove the 4.7K resistor from J5 pin C and insert it into pin B of J2. The voltmeter should indicate +5 volts only when BAND 2 pushbutton is depressed.

h. Repeat step (g.) with the resistor inserted in J5 pin D.

i. Repeat this sequence at the remaining J2 and J5 pins, as outlined in Table 5-1.

TABLE 5-1. Local Mode Switching Voltages

Band Selector	J2 Connector A	B	C	D	E	F	H	J	TB1 Pin 1	Pin 2
AUX	0	0	0	0	0	0	0	0	OPEN COL.	5
BAND 1*	5	0	0	0	0	0	0	0	GND	0
2*	0	5	0	0	0	0	0	0	GND	0
3	0	0	5	0	0	0	0	0	GND	0
4	0	0	0	5	0	0	0	0	GND	0
5	0	0	0	0	5	0	0	0	GND	0
6	0	0	0	0	0	5	0	0	GND	0
7	0	0	0	0	0	0	5	0	GND	0
8	0	0	0	0	0	0	0	5	GND	0
	C	D	E	F	H	J	K	B		
	J5 Connector									

* If 4302B is wired for 438A operation, the J2 and J5 Band 2 connectors will be +5V, in addition to Band 1, when Band 1 is selected.

j. Connect the voltmeter between TB1 pin 3 (GND) and TB1 pin 1 (+).

k. Connect the 4.7K, ±10%, 1/4 watt resistor between TB1 pin 1 and pin B on J3. Meter should indicate +5 (±1) volts. When any of the other BAND SELECTOR pushbuttons are depressed, the meter should indicate 0.4 (±0.4) volts.

l. Connect the 4.7K, resistor between TB1 pin 3 and TB1 pin 2. Connect the meter across the 4.7K resistor with the (+) lead to TB1 pin 2.

m. The meter should indicate +5 (±1) volts when the AUX button is depressed and 0 volts when any BAND SELECTOR pushbutton is depressed.

5.3.2 REMOTE SWITCHING MODE

a. Using the test resistor and piece of wire assembled in Paragraph 5.3.1, connect one end of the wire to pin 3 of TB1.

b. Apply main power to the Model 430.

c. On the Model 4302B, depress the BAND MODE REMOTE pushbutton.

d. Insert the free end of the resistor (4.7K) into pin A of the rear panel connector J2 on the Model 4302B.

e. On connector J4 of the Model 4302B, apply input logic levels to pins E, C, B and A as indicated in Table 5-2 for BAND 1.

f. Connect voltmeter leads across the 4.7K resistor (+ lead to J2 side of resistor). The meter should indicate +5 (±1) volts.

g. With the voltmeter still connected across the resistor, apply logic levels in sequence to J4 pins as indicated by Table 5-2 and observe that the meter indication remains at zero volts.

h. Repeat this procedure with the 4.7K resistor inserted in J5 pin C.

i. Remove the test resistor from J5 pin C and insert it into J2 pin B and apply the proper logic levels for Band 2. The voltmeter reading across the resistor should indicate +5 (±1) volts.

Table 5-2. Remote Mode Band Switching

Input Logic Levels at J4				Remote Band Selected*
E	C	B	A	
0	0	0	0	AUX
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
1	0	0	0	7
1	0	0	1	8

* J2, J5 and TB1 voltages are the same as indicated in Table 5-1, for each Band.

j. Apply logic levels for the other bands to J4 pins as indicated by Table 5-2 and observe that the meter indication remains at zero.

k. Repeat this sequence for Bands 3 through 8. The voltmeter should only measure +5 (±1) volts (at J2 and J5), as indicated by Table 5-1, when the proper logic levels are applied for that Band.

l. Connect the test resistor between pins 3 and 2 of TB1 and measure the voltage across the resistor (+ lead to TB 1-2). The meter should indicate +5 (±1) volts only when logic 0's are applied to J4, pins E, C, B and A. All other logic inputs should result in a zero volt reading.

5.3.3 PRESET M1 CONTROL

a. Set the multimeter to measure continuity and connect the leads between TB1 pin 5 and TB1 pin 6. The meter should read zero ohms.

b. Connect the meter between TB1 pin 7 and TB1 pin 8. The meter should read zero ohms.

c. Connect a piece of hook-up wire between TB1 pin 3 and J3 pin E. The meter connected between pins 7 and 8 of TB1 should read ∞ when the Model 430 SWEEP FUNCTION switch is in either the CW M1 or SYM M1 positions. The meter should read zero ohms for any other position of the SWEEP FUNCTION switch.

d. Connect the meter between TB1 pin 5 and TB1 pin 6. The meter should read ∞ when the SWEEP FUNCTION switch is in CW M1 or SYM M1 position. For any other position of the SWEEP FUNCTION switch the meter should read zero ohms.

e. Set the SWEEP FUNCTION switch to the CW M1 position. Connect the ohmmeter between TB1 pin 6 and J3 pin D. The meter should read zero ohms in the CW M1 and SYM M1 positions of the SWEEP FUNCTION switch only.

f. Connect the ohmmeter between TB1 pin 8 and pin H of J3. The meter should read zero ohms only when the SWEEP FUNCTION switch is set to either CW M1 or SYM M1.

g. Connect the meter between J1 pin 22 and TB1 pin 6. The meter should read ∞ for any setting of the 430 SWEEP FUNCTION switch.

h. Connect a piece of hookup wire between J1 pin 21 and TB1 pin 3. The meter reading should now show zero ohms when the 430 SWEEP FUNCTION switch is in CW M1 or SYM M1 position.

This completes the performance checks for the Model 4302B. No calibration or alignment steps are required.

SECTION 6
REPLACEABLE PARTS

6.1 INTRODUCTION

This section provides information for procuring replaceable parts for the Model 4302B. The listed parts include all items subject to burnout, breakage or deterioration during normal equipment operation.

6.2 ORDERING INFORMATION

The following information should be included when ordering replacement parts.

a. Weinschel Engineering part number and description of part.

b. The instrument model and serial numbers.

NOTE

When ordering a part not included in the Replaceable Parts List, include a complete description of the part, its functions and its location within the equipment.

6.3 PARTS LIST

Parts listings for the Model 4302B and Assembly A1 are provided in Tables 6-1 and 6-2.

Component location drawings (Figures 6-1 and 6-2) are provided adjacent to the applicable parts list.

6.4 MANUFACTURER CODES

Manufacturer codes are identified in Appendix A of this manual.

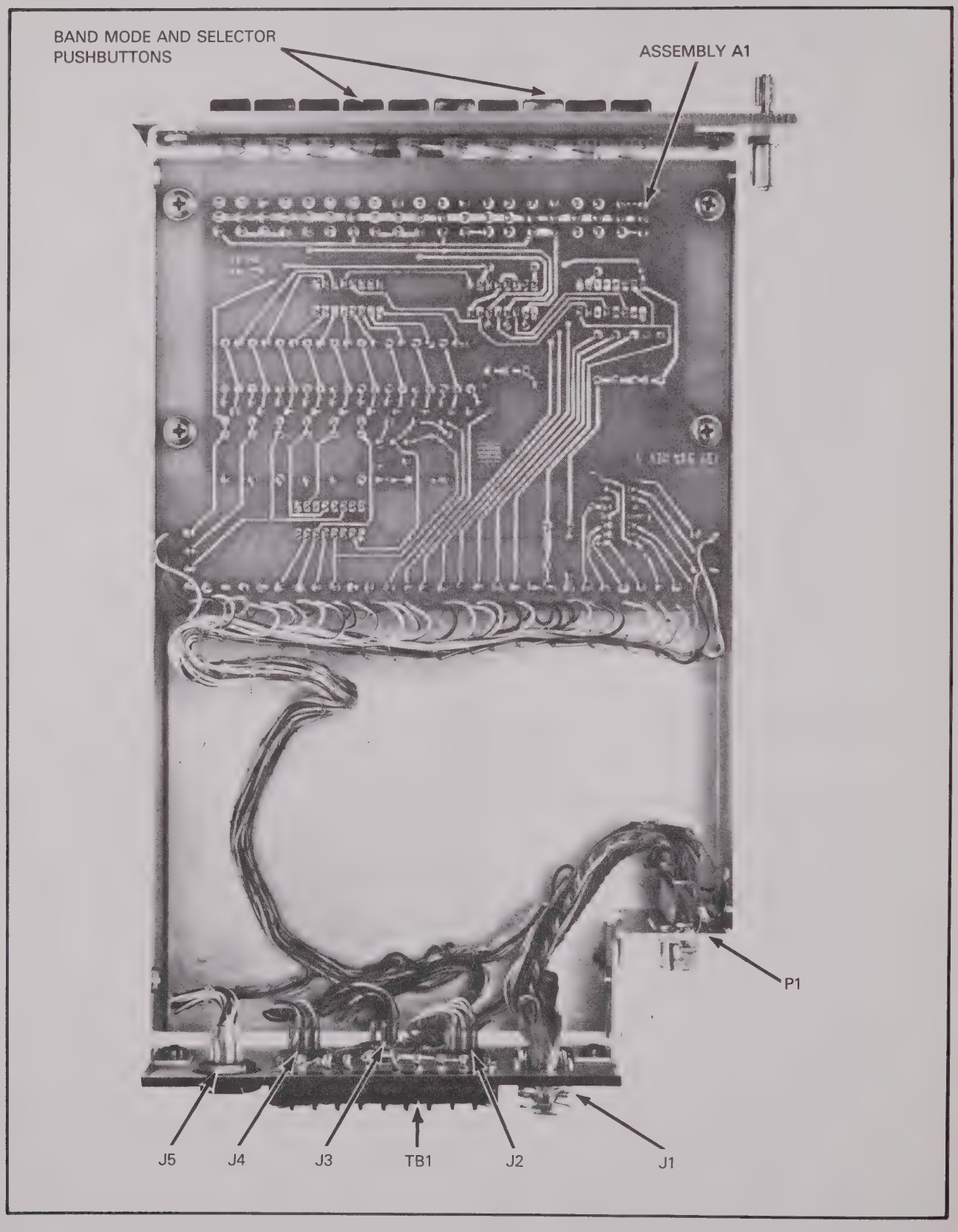


Figure 6-1. Model 4302B Basic Chassis Assembly

Table 6-1. Basic Chassis Assembly Parts List

Ref. Des.	Description	Part Number	Mfr. Part Number	Mfr. Code
A1	Control Logic P.C. Board Assembly	D139-937		93459
J1	Connector, Receptacle	62-150	57-40360	13511
J2	Connector, Receptacle	62-76	126-221	13511
J3	Connector, Receptacle	62-74	126-218	13511
J4	Connector, Receptacle	62-76	126-221	13511
J5	Connector, Receptacle	62-76	126-221	13511
P1	Connector, Plug	62-161	57-10360	13511
TB1	Terminal Block, 8 Contacts	65-6-10	410-Y-8	75382
#1	Cable Assembly	C139-942		93459
#2	Cable Assembly	C139-947		93459
#3	Cable Assembly	B139-507-2		93459

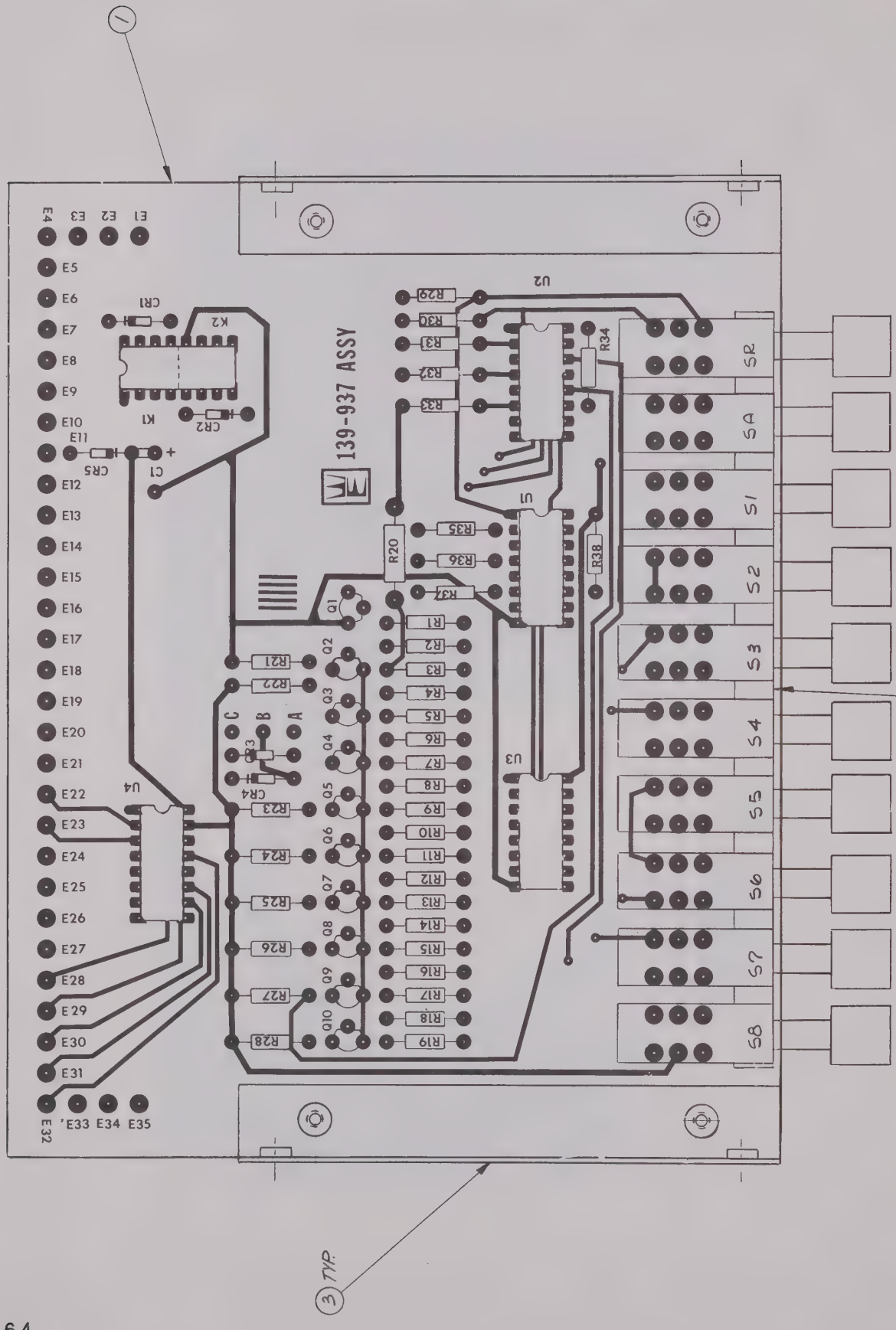


Figure 6-2 Assembly A1, Component Location

Table 6-2. Assembly A1, Control Logic Board Parts List

Ref. Des.	Description	Part Number	Mfr. Part Number	Mfr. Code
A1	Control Logic Assembly	D139-937		93459
C1	Capacitor, 100μf, 20V, 20%	31-76	T362D107M020	31433
CR1	Diode, signal	12-99	1N483B	07688
CR2	Diode, signal	12-99	1N483B	07688
CR3	Diode, signal	12-51	1N3064	07688
CR4	Diode, signal	12-51	1N3064	07688
CR5	Diode, signal	12-99	1N483B	07688
K1	Relay, DPDT	47-32	53451-1	89110
K2	Relay, DPDT	47-32	53451-1	89110
Q1	Transistor, NPN	12-139	2N4401	07688
Q2	Transistor, PNP	12-140	2N4403	07688
Q3	Transistor, PNP	12-140	2N4403	07688
Q4	Transistor, PNP	12-140	2N4403	07688
Q5	Transistor, PNP	12-140	2N4403	07688
Q6	Transistor, PNP	12-140	2N4403	07688
Q7	Transistor, PNP	12-140	2N4403	07688
Q8	Transistor, PNP	12-140	2N4403	07688
Q9	Transistor, PNP	12-140	2N4403	07688
Q10	Transistor, PNP	12-140	2N4403	07688
R1	Resistor, 4.7K, 1/4W, 5%	25-25-4700	RC07GF472J	81349
R2	Resistor, 2.2K, 1/4W, 5%	25-25-2200	RC07GF222J	81349
R3	Resistor, 1K, 1/4W, 5%	25-25-1000	RC07GF102J	81349
R4	Resistor, 2.2K, 1/4W, 5%	25-25-2200	RC07GF222J	81349
R5	Resistor, 1K, 1/4W, 5%	25-25-1000	RC07GF102J	81349
R6	Resistor, 2.2K, 1/4W, 5%	25-25-2200	RC07GF222J	81349
R7	Resistor, 1K, 1/4W, 5%	25-25-1000	RC07GF102J	81349
R8	Resistor, 2.2K, 1/4W, 5%	25-25-2200	RC07GF222J	81349
R9	Resistor, 1K, 1/4W, 5%	25-25-1000	RC07GF102J	81349
R10	Resistor, 2.2K, 1/4W, 5%	25-25-2200	RC07GF222J	81349
R11	Resistor, 1K, 1/4W, 5%	25-25-1000	RC07GF102J	81349
R12	Resistor, 2.2K, 1/4W, 5%	25-25-2200	RC07GF222J	81349
R13	Resistor, 1K, 1/4W, 5%	25-25-1000	RC07GF102J	81349
R14	Resistor, 2.2K, 1/4W, 5%	25-25-2200	RC07GF222J	81349
R15	Resistor, 1K, 1/4W, 5%	25-25-1000	RC07GF102J	81349
R16	Resistor, 2.2K, 1/4W, 5%	25-25-2200	RC07GF222J	81349
R17	Resistor, 1K, 1/4W, 5%	25-25-1000	RC07GF102J	81349
R18	Resistor, 2.2K, 1/4W, 5%	25-25-2200	RC07GF222J	81349
R19	Resistor, 1K, 1/4W, 5%	25-25-1000	RC07GF102J	81349

Table 6-2. Assembly A1, Control Logic Board Parts List Cont'd.

Ref. Des.	Description	Part Number	Mfr. Part Number	Mfr. Code
R20	Resistor, 22¯, 1/4W, 5%	25-25-22	RC07GF220J	81349
R21	Resistor, 10K, 1/4W, 5%	25-25-10000	RC07GF103J	81349
R22	Resistor, 10K, 1/4W, 5%	25-25-10000	RC07GF103J	81349
R23	Resistor, 10K, 1/4W, 5%	25-25-10000	RC07GF103J	81349
R24	Resistor, 10K, 1/4W, 5%	25-25-10000	RC07GF103J	81349
R25	Resistor, 10K, 1/4W, 5%	25-25-10000	RC07GF103J	81349
R26	Resistor, 10K, 1/4W, 5%	25-25-10000	RC07GF103J	81349
R27	Resistor, 10K, 1/4W, 5%	25-25-10000	RC07GF103J	81349
R28	Resistor, 10K, 1/4W, 5%	25-25-10000	RC07GF103J	81349
R29	Resistor, 10K, 1/4W, 5%	25-25-10000	RC07GF103J	81349
R30	Resistor, 10K, 1/4W, 5%	25-25-10000	RC07GF103J	81349
R31	Resistor, 10K, 1/4W, 5%	25-25-10000	RC07GF103J	81349
R32	Resistor, 10K, 1/4W, 5%	25-25-10000	RC07GF103J	81349
R33	Resistor, 10K, 1/4W, 5%	25-25-10000	RC07GF103J	81349
R34	Resistor, 10K, 1/4W, 5%	25-25-10000	RC07GF103J	81349
R35	Resistor, 10K, 1/4W, 5%	25-25-10000	RC07GF103J	81349
R36	Resistor, 10K, 1/4W, 5%	25-25-10000	RC07GF103J	81349
R37	Resistor, 10K, 1/4W, 5%	25-25-10000	RC07GF103J	81349
R38	Resistor, 10K, 1/4W, 5%	25-25-10000	RC07GF103J	81349
S1	Switch, Pushbutton	B55-71		
U1	I.C., Tri-State Hex Inverter	15-01-C098	MM80C98N	12040
U2	I.C., Tri-State Hex Buffer	15-01-C097	MM80C97N	12040
U3	I.C., BCD/Decimal Decoder	12-207	SN7442N	12040
U4	I.C., Tri-State Hex Buffer	15-01-C097	MM80C97N	12040

SECTION 7
SCHEMATIC DIAGRAMS

7.1 INTRODUCTION

This section contains schematic diagrams for the Model 4302B. For component information, refer to the component location drawings and corresponding parts list located in Section 6 of this manual.

7.2 LIST OF FIGURES

The following is a list of figures contained in this section.

Figure 7-1 P1 Connections to Model 430 Mainframe

Figure 7-2 Model 4302B Overall Schematic Diagram

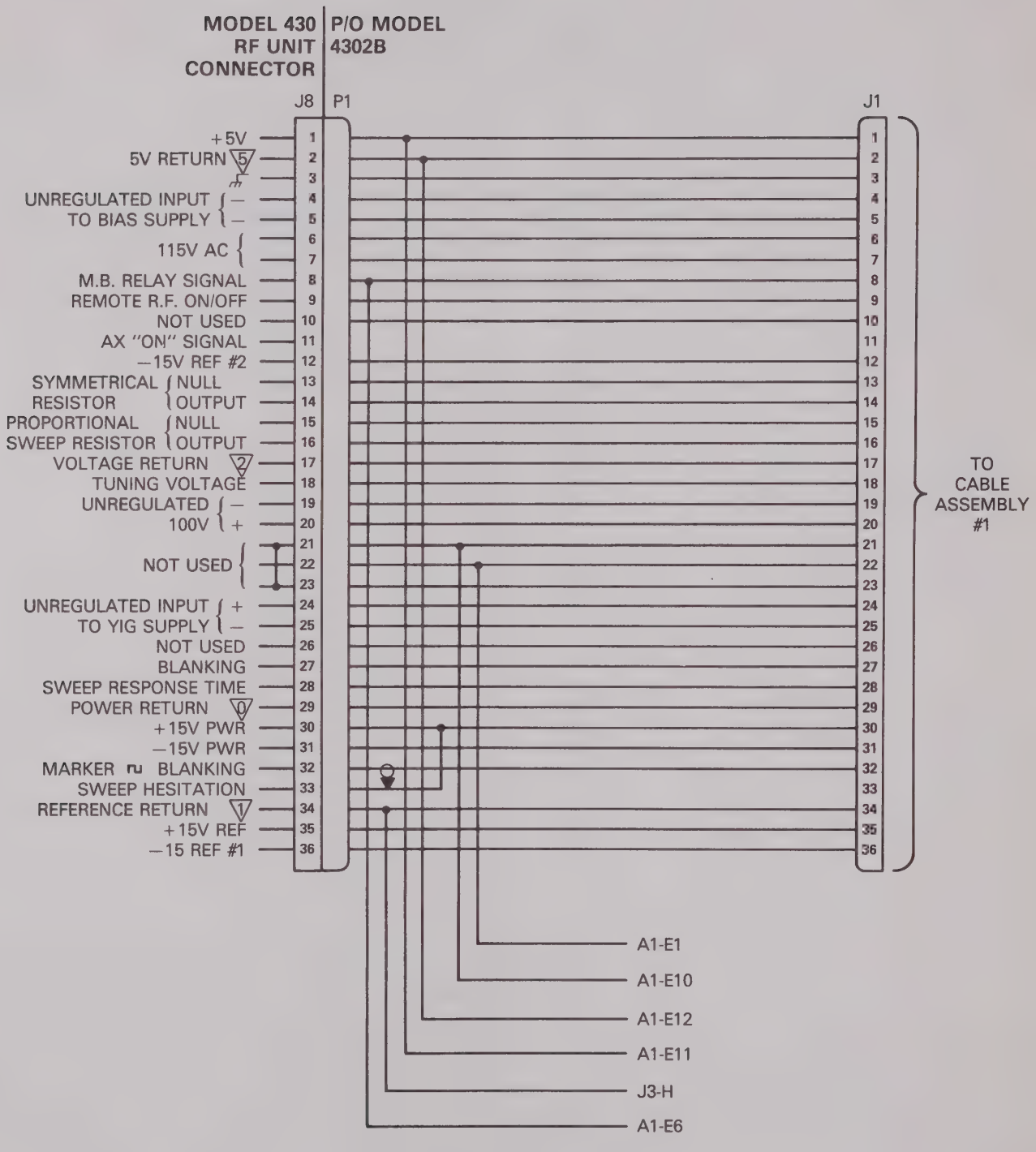


Figure 7-1 P1 Connections to Model 430 Mainframe

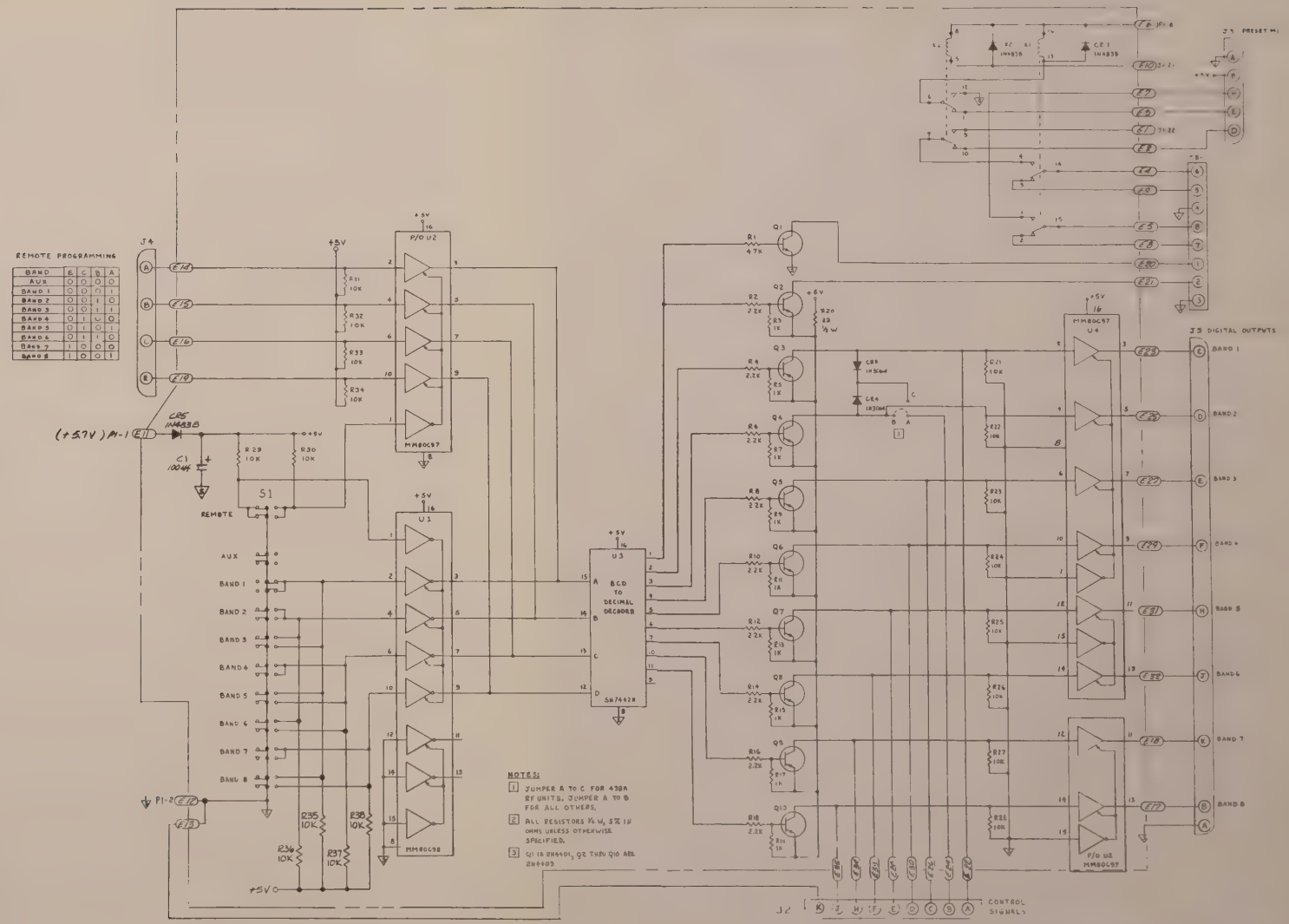


Figure 7-2 Model 4302B, Overall Schematic Diagram

CODE LIST OF MANUFACTURERS

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 (Name to Code) and H4-2 (Code to Name) and their latest supplements. The date of revision and the date of the supplements used appear at the bottom of each page. Alphabetical codes have been arbitrarily assigned to suppliers not appearing in the H4 Handbooks.

Code No.	Manufacturer/Address
00000	U.S.A. Common: Any supplier of U.S.
00136	McCoy Electronics: Mount Holly Springs, Pa.
00213	Sage Electronics Corp.: Rochester, N.Y.
00287	Cemco Inc.: Danielson, Conn.
00334	Humidial: Colton, Calif.
00348	Microtron Co., Inc.: Valley Stream, N.Y.
00373	Garlock Inc.: Cherry Hill, N.J.
00656	Aerovox Corp.: New Bedford, Mass.
00779	Amp. Inc.: Harrisburg, Pa.
00781	Aircraft Radio Corp.: Boonton, N.J.
00815	Northern Engineering Laboratories, Inc.: Burlington, Wis.
00853	Sangamo Electric Co., Pickens Div.: Pickens, S.C.
00866	Goe Engineering Co.: City of Industry, Calif.
00891	Carl F. Holmes Corp.: Los Angeles, Calif.
00929	Microlab Inc.: Livingston, N.J.
01002	General Electric Co., Capacitor Dept.: Hudson Falls, N.Y.
01009	Alden Products Co.: Brockton, Mass.
01121	Allen Bradley Co.: Milwaukee, Wis.
01255	Litton Industries, Inc.: Beverly Hills, Calif.
01281	TRW Semiconductors, Inc.: Lawndale, Calif.
01295	Texas Instruments, Inc., Transistor Products Div.: Dallas, Texas
01349	The Alliance Mfg. Co.: Alliance, Ohio
01589	Pacific Relays, Inc.: Van Nuys, Calif.
01670	Gudebrod Bros, Silk Co.: New York, N.Y.
01884	Sprague: Longwood, Fla.
01930	Amerock Corp.: Rockford, Ill.
01961	Pulse Engineering Co. : Santa Clara, Calif.
02114	Ferroxcube Corp. of America: Saugerties, N.Y.
02116	Wheelock Signals, Inc.: Long Branch, N.J.
02286	Cole Rubber and Plastics Inc.: Sunnyvale, Calif.
02660	Amphenol-Borg Electronics Corp.: Broadview, Ill.
02735	Radio Corp. of America, Semiconductor and Materials Div.: Somerville, N.J.
02771	Vocaline Co. of America, Inc.: Old Saybrook, Conn.
02777	Hopkins Engineering Co.: San Fernando, Calif.
02875	Hudson Tool & Die Co.: Newark, N.J.
03508	G. E. Semiconductor Prod. Dept.: Syracuse, N.Y.
03705	Apex Machine & Tool Co.: Dayton, Ohio
03797	Eldema Corp.: Compton, Calif.
03818	Parker Seal Co.: Los Angeles, Calif.
03877	Transitron Electric Corp.: Wakefield, Mass.
03888	Pyrofilm Resistor Co., Inc.: Cedar Knolls, N.J.
03954	Singer Co., Diehl Div. Finderne Plant: Sumerville, N.J.
04009	Arrow, Hart and Hegeman Elect. Co.: Hartford, Conn.
04013	Taurus Corp.: Lambertville, N.J.
04062	Arco Electronic Inc.: Great Neck, N.Y.
04222	Hi-Q Division of Aerovox: Myrtle Beach, S.C.
04354	Precision Paper Tube Co.: Wheeling, Ill.
04404	Dymec Division of Hewlett-Packard Co.: Palo Alto, Calif.
04651	Sylvania Electric Products, Microwave Device Div.: Mountain View, Calif.
04673	Dakota Engr. Inc.: Culver City, Calif.
04713	Motorola, Inc., Semiconductor Prod. Div.: Phoenix, Arizona
04732	Filtron Co., Inc. Western Div.: Culver City, Calif.
04773	Automatic Electric Co.: Northlake, Ill.
04796	Sequoia Wire Co.: Redwood City, Calif.
04811	Precision Coil Spring Co. : El Monte, Calif.
04870	P. M. Motor Company: Westchester, Ill.
04919	Component Mfg. Service Co.: W. Bridgewater, Mass.
05006	Twentieth Century Plastics, Inc.: Los Angeles, Calif.
05245	Components Corp.: Chicago, Ill.
05277	Westinghouse Electric Corp., Semi-Conductor Dept. Youngwood, Pa.
05347	Ultronix, Inc.: San Mateo, Calif.
05397	Union Carbide Corp., Elect. Div.: New York, N.Y.
05574	Viking Ind. Inc.: Canoga Park, Calif.
05593	Icore Electro-Plastics Inc.: Sunnyvale, Calif.
05616	Cosmo Plastic (c/o Electrical Spec. Co.): Cleveland, Ohio
05624	Barber Colman Co.: Rockford, Ill.
05728	Tiffen Optical Co.,: Roslyn Heights, Long Island, N.Y.
05729	Metro-Tel Corp.: Westbury, N.Y.
05783	Stewart Engineering Co.: Santa Cruz, Calif.
05820	Wakefield Engineering Inc.: Wakefield, Mass.
06004	Bassick Co., Div. of Stewart Warner Corp.: Bridgeport, Conn.
06090	Raychem Corp.: Redwood City, Calif.
06175	Bausch and Lomb Optical.: Rochester, N.Y.
06402	E.T.A. Products Co. of America: Chicago, Ill.
06540	Amatom Electronic Hardware Co., Inc.: New Rochelle, N.Y.
06555	Beede Electrical Instrument Co., Inc.: Penacook, N.H.
06666	General Devices Co., Inc.: Indianapolis, Ind.
06751	Components Inc., Ariz. Div.: Phoenix, Ariz.
06812	Torrington Mfg. Co., West Div.: Van Nuys, Calif.
06980	Varian Assoc. Eimac Div.: San Carlos, Calif.
07088	Kelvin Electric Co.: Van Nuys, Calif.
07126	Digitran Co.: Pasadena, Calif.
07137	Transistor Electronics Corp.: Minneapolis, Minn.
07138	Westinghouse Electric Corp., Electronic Tube Div.: Elmira, N.Y.
07149	Filmohm Corp.: New York, N.Y.
07233	Cinch-Graphik Co.: City of Industry, Calif.
07256	Silicon Transistor Corp.: Carle Place, N.Y.
07261	Avnet Corp.: Culver City, Calif.
07263	Fairchild Camera & Inst. Corp, Semiconductor Div.: Mountain View, Calif.
07322	Minnesota Rubber Co.: Minneapolis, Minn.
07387	Birtcher Corp., The: Monterey Park, Calif.
07397	Sylvania Elect. Prod. Inc.,: Mt. View Operations: Mountain View, Calif.
07688	Joint Electron Device Engineering Council
07700	Technical Wire Products Inc.: Cranford, N. J.
07829	Bodine Elect. Cp.: Chicago, Ill.
07910	Continental Device Corp.: Hawthorne, Calif.

LIST OF MANUFACTURERS (Continued)

Code No.	Manufacturer/Address
07933	Raytheon Mfg. Co., Semiconductor Div.: Mountain View, Calif.
07980	Hewlett-Packard Co., Boonton Radio Div.: Rockaway, N.J.
08145	U.S. Engineering Co.: Los Angeles, California
08289	Blinn, Delbert Co.: Pomona, Calif.
08358	Burgess Battery Co.: Niagara Falls, Ontario, Canada
08524	Deutsch Fastener Corp.: Los Angeles, Calif.
08664	Bristol., The: Waterbury, Conn.
08717	Sloan Company: Sun Valley, Calif.
08718	ITT Cannon Electric Inc., Phoenix Div.: Phoenix, Arizona
08727	National Radio Lab. Inc.: Paramus, N.J.
08792	CBS Electronics Semiconductor Operations, Div. of C. B. S. Inc.: Lowell, Mass.
08806	General Electric Co. Miniat. Lamp Dept.: Cleveland, Ohio
08984	Mel-Rain: Indianapolis, Ind.
09021	Airco Speer: Bedford, Pa.
09026	Babcock Relays Div.: Costa Mesa, Calif.
09134	Texas Capacitor Co.: Houston, Texas
09145	Tech. Ind. Inc. Atohm Elect.: Burbank, Calif.
09250	Electro Assemblies, Inc.: Chicago, Ill.
09353	C & K Components Inc.: Newton, Mass.
09569	Mallory Battery Co. of Canada, Ltd.: Toronto, Ontario, Canada
09922	Burndy Corp.: Norwalk, Conn.
09969	Dale: Yankgon, S.D.
10214	General Transistor Western Corp.: Los Angeles, Calif.
10411	Ti-Tal, Inc.: Berkeley, Calif.
10646	Carborundum Co.: Niagara Falls, N.Y.
11236	CTS of Berne, Inc.: Berne, Ind.
11237	Chicago Telephone of California, Inc.: So. Pasadena, Calif.
11242	Bay State Electronics Corp.: Waltham, Mass.
11312	Teledyne Inc., Microwave Div.: Palo Alto, Calif.
11314	National Seal: Downey, Calif.
11453	Precision Connector Corp.: Jamaica, N.Y.
11534	Duncan Electronics Inc.: Costa Mesa, Calif.
11711	General Instrument Corp., Semiconductor Div., Products Group: Newark, N.J.
11717	Imperial Electronic, Inc.: Buena Park, Calif.
11870	Melabs, Inc.: Palo Alto, Calif.
12040	National Semiconductor: Danbury, Conn.
12136	Philadelphia Handle Co.: Camden, N.J.
12300	Potter and Brumfield: Ontario, Canada
12361	Grove Mfg. Co., Inc.: Shady Grove, Pa.
12574	Gulton Ind. Inc. Data System Div.: Albuquerque, N.M.
12697	Clarostat Mfg. Co.: Dover, N.H.
12728	Elmar Filter Corp.: W. Haven, Conn.
12859	Nippon Electric Co., Ltd.: Tokyo, Japan
12881	Metex Electronics Corp.: Clark, N.J.
12930	Delta Semiconductor Inc.: Newport Beach, Calif.
12954	Dickson Electronics Corp.: Scottsdale, Arizona
13103	Thermolloy: Dallas, Texas
13396	Telefunken (GmbH): Hanover, Germany
13511	Amphenol: Gatos, Calif.
13835	Midland-Wright Div. of Pacific Industries, Inc.: Kansas City, Kansas
14099	Sem-Tech: Newbury Park, Calif.
14193	Calif. Resistor Corp.: Santa Monica, Calif.
14298	American Components, Inc.: Conshohocken, Pa.
14433	ITT Semiconductor, A Div. of Int. Telephone & Telegraph Corp.: West Palm Beach, Fla.
14493	Hewlett-Packard Company: Loveland, Colo.
14655	Cornell Dublier Electric Corp.: Newark, N.J.
14674	Corning Glass Works: Corning, N.Y.
14752	Electro Cube Inc.: San Gabriel, Calif.
14960	Williams Mfg. Co: San Jose, Calif.
15203	Webster Electronics Co.: New York, N.Y.
15287	Scionics Corp.: Northridge, Calif.
15291	Adjustable Bushing Co.: N. Hollywood, Calif.
15556	Micron Electronics: Garden City, Long Island, N.Y.
15566	Amprobe Inst. Corp.: Lynbrook, N.Y.
15631	Cabletronics: Costa Mesa, Calif.
15772	Twentieth Century Coil Spring Co.,: Santa Clara, Calif
15801	Fenwal Elect. Inc.: Framingham, Mass.
15818	Amelco Inc.: Mt. View, Calif.
16037	Spruce Pine Mica Co.: Spruce Pine, N.C.
16179	Omni-Spectra Inc.: Farmington, Mich.
16352	Computer Diode Corp.: Lodi, N.J.
16428	Belden Corp.: Richmond, Ind.
16585	Boots Aircraft Nut Corp.: Pasadena, Calif.
16688	Ideal Prec. Meter Co., Inc. De Jur Meter Div.: Brooklyn, N.Y.
16758	Delco Radio Div. of G. M. Corp.: Kokoma, Ind
17109	Thermonetics Inc.: Canoga Park, Calif.
17474	Tranex Company: Mountain View, Calif.
17554	Components Inc.: Biddeford, Ma.
17675	Hamlin Metal Products Corp.: Akron, Ohio
17745	Angstrohm Prec. Inc.: No Hollywood, Calif.
17850	Zeltex, Inc.: Concord, Calif.
17870	McGraw-Edison Co.: Manchester, N.H.
18042	Power Design Pacific Inc.: Palo Alto, Calif.
18083	Clevite Corp., Semiconductor Div.: Palo Alto Calif.
18324	Signetics Corp.: Sunnyvale, Calif.
18476	Ty-Car Mfg. Co., Inc.: Holliston, Mass.
18486	TRW Elect. Comp. Div.: Des Plaines, Ill.
18583	Curtis Instrument, Inc.: Mt. Kisco, N.Y.
18612	Vishay Instruments Inc.: Malvern, Pa.
18873	E. I. DuPont and Co., Inc.: Wilmington, Del.
18911	Durant Mfg. Co.: Milwaukee, Wis.
19315	The Bendix Corp., Navigation & Control Div.: Teterboro N. J.
19500	Thomas A. Edison Industries, Div. of McGraw-Edison Co.: West Orange, N.J.
19589	Concoa: Baldwin Park, Calif.
19644	LRC Electronics: Horseheads, N.Y.
19701	Electra Mfg. Co.: Independence, Kansas
20183	General Atronics Corp.: Philadelphia, Pa.
21226	Executone, Inc.: Long Island City, N.Y.
21335	Fafnir Bearing Co., The: New Britain, Conn.
21520	Fansteel Metallurgical Corp.: N. Chicago, Ill.
23042	Texscan Corp.: Indianapolis, Ind.
23783	British Radio Electronics Ltd.: Washington, D.C
24455	G. E. Lamp Division: Nela Park, Cleveland, Ohio
24655	General Radio Co.: West Concord, Mass.
24681	Memcor Inc., Comp. Div.: Huntington, Ind.

LIST OF MANUFACTURERS (Continued)

Code No.	Manufacturer/Address
24796	Parelco Inc.: San Juan Capistrano, Calif.
26365	Gries Reproducer Corp.: New Rochelle, N.Y.
26462	Grobet File Co. of America, Inc.: Carlstadt, N.J
26851	Compac/Hollister Co.: Hollister, Calif.
26992	Hamilton Watch Co.: Lancaster, Pa.
27014	National Semi-Conductor: Santa Clara, Calif.
27251	Specialities Mfg. Co., Inc.: Stratford, Conn.
28480	Hewlett-Packard Co.: Palo Alto, Calif.
28520	Heyman Mfg. Co.: Kenilworth, N. J.
30817	Instrument Sepcialities Co., Inc.: Little Falls, N.J.
31433	Union Carbide: Greenville, S.C.
32997	Bourns, Inc., Trimpot Dia.: Riverside, Calif.
33173	G. E. Receiving Tube Dept.: Ownesboro, Ky.
35434	Lectrohm Inc.: Chicago, Ill
36196	Stanwyck Coil Products Ltd.: Hawkesbury, Ontario, Canada
36287	Cunningham, W. H. & Hill, Ltd.: Toronto Ontario, Canada
37942	P. R. Mallory & Co. Inc.: Indianapolis, Ind.
39543	Mechanical Industries Prod. Co.: Akron, Ohio
40920	Miniature Precision Bearings, Inc.: Keene, N. H.
42190	Muter Co.: Chicago, Ill.
43990	C. A. Norgren Co.: Englewood, Colo.
44655	Ohmite Mfg. Co.: Skokie, Ill.
46384	Penn Eng. & Mfg. Corp.: Doylestown, Pa.
47904	Polaroid Corp.: Cambridge, Mass.
48620	Precision Thermometer & Inst. Co.: Southampton, Pa.
49956	Microwave & Power Tube Div.: Waltham, Mass.
50139	Allen Bradley: Salt Lake City, Utah
50434	Hewlett-Packard Co.: Palo Alto, Calif.
50721	Datel Systems: Canton, Ma.
52090	Rowan Controller Co.: Westminster, Md.
53983	Sanborn Company: Waltham, Mass.
54294	Shallcross Mfg. Co.: Selma, N.C.
55026	Simpson Electric Co.: Chicago, Ill.
55933	Sonotone Corp.: Elmsford, N.Y.
55938	Raytheon Co. Commercial Apparatus & Systems Div.: So. Norwalk, Conn.
56137	Spaulding Fibre Co., Inc. Tonawanda, N.Y.
56289	Sprague Electric Co.: North Adams, Mass.
59446	Telex Corp.: Tulsa, Okla.
59730	Thomas & Betts Co.: Elizabeth, N.J.
60741	Triplett Electrical Inst. Co.: Bluffton, Ohio
61775	Union Switch and Signal, Div. of Westinghouse Air Brake Co.: Pittsburgh, Pa.
62119	Universal Electric Co.: Owosso, Mich.
63743	Ward-Leonard Electric Co.: Mt. Vernon, N.Y.
64959	Western Electric Co., Inc.: New York, N.Y.
65092	Weston Inst. Inc. Weston-Newark: Newark, N.J.
66295	Wittek Mfg. Co.: Chicago, Ill.
66346	Minnesota Mining & Mfg. Co. Revere Mincom Div.: St. Paul, Minn.
70109	Adams and Westlake: Elkhart, Ind.
70276	Allen Mfg. Co.: Hartford, Conn.
70309	Allied Control: New York, N.Y.
70318	Allmetal Screw Product Co., Inc.: Garden City, N.Y.
70417	Amplex, Div. of Chrysler Corp. Detroit, Mich.
70485	Atlantic India Rubber Works, Inc.: Chicago, Ill.
70563	Amperite Co., Inc.: Union City, N.J.
70674	ADC Products Inc.: Minneapolis, Minn.
70903	Belden Mfg. Co.: Chicago, Ill.
70998	Bird Electronic Corp.: Cleveland, Ohio
71002	Birnbach Radio Co.: New York, N.Y.
71034	Bliley Electric Co., Inc.: Erie, Pa.
71041	Boston Gear Works Div. of Murray Co. of Texas: Quincy, Mass.
71218	Bud Radio, Inc.: Willoughby, Ohio.
71279	Cambridge Thermionics Corp.: Cambridge, Mass.
71286	Camloc Fastener Corp.: Paramus, N.J.
71313	Cardwell Condenser Corp.: Lindenhurst, L.I., N.Y.
71400	Bussmann Mfg. Div. of McGraw-Edison Co.: St. Louis, Mo.
71436	Chicago Condenser Corp.: Chicago, Ill.
71447	Calif. Spring Co., Inc.: Pico-Rivera, Calif.
71450	CTS Corp.: Elkhart, Ind.
71468	ITT Cannon Electric Inc.: Los Angeles, Calif.
71471	Cinema, Div. Aerovox Corp.: Burbank, Calif:
71482	C. P. Glare & Co.: Chicago, Ill.
71590	Centralab Div. of Globe Union Inc. Milwaukee, Wis.
71616	Commercial Plastics Co.: Chicago, Ill.
71700	Cornish Wire Co., The: New York, N.Y.
71707	Coto Coil Co., Inc.: Providence, R.I.
71744	Chicago Miniature Lamp Works: Chicago, Ill.
71785	Cinch Mfg. Co., Howard B. Jones Div.: Chicago, Ill.
71984	Dow Corning Corp.: Midland, Mich.
72136	Electro Motive Mfg. Co., Inc.: Willimantic, Conn.
72619	Dialight Corp.: Brooklyn, N.Y.
72656	Indiana General Corp., Electronics Div.: Keasby, N.J.
72699	General Instrument Corp., Cap. Div. Newark, N.J.
72765	Drake Mfg. Co.: Harwood Heights, Ill.
72825	Hugh H. Eby Inc.: Philadelphia, Pa.
72928	Gudeman Co.: Chicago, Ill.
72962	Elastic Stop Nut Corp.: Union,N.J.
72964	Robert M. Hadley Co.: Los Angeles, Calif.
72982	Erie Technological Products, Inc.: Erie, Pa.
73061	Hansen Mfg. Co., Inc.: Princeton, Ind.
73076	H. M. Harper Co.: Chicago, Ill.
73138	Helipot Div. of Beckman Inst., Inc.: Fullerton, Calif.
73293	Hughes Products Division of Hughes Aricraft Co.: Newport Beach, Calif.
73445	Amperex Elect. Co.: Hicksville, L.I., N.Y.
73506	Bradley Semiconductor Corp.: New Haven, Conn.
73559	Carling Electric, Inc.: Hartford, Conn.
73586	Circle F. Mfg. Co.: Trenton, N.J.
73682	George K. Garrett Co., Div. MSL Industries Inc.: Philadelphia, Pa.
73734	Federal Screw Products Inc.: Chicago, Ill.
73743	Fischer Special Mfg. Co.: Cincinnati, Ohio
73793	General Industries Co., The: Elyria, Ohio
73846	Goshen Stamping & Tool Co.: Goshen, Ind.
73899	JFD Electronics Corp.: Brooklyn, N.Y.
73905	Jennings Radio Mfg. Corp.: San Jose, Calif.
73957	Groov-Pin Corp.: Ridgefield, N.J.
74276	Signalite Inc.: Nepture, N.J.
74455	J. H. Winns, and Sons: Winchester, Mass.
74861	Industrial Condenser Corp.: Chicago, Ill.
74868	R. F. Products Division of Amphenol-Borg Electronics Corp.: Danbury, Conn.

LIST OF MANUFACTURERS (Continued)

Code No.	Manufacturer/Address
74970	E. F. Johnson Co.: Waseca, Minn.
75042	International Resistance Co.: Philadelphia, Pa.
75263	Keystone Carbon Co., Inc.: St. Marys, Pa.
75378	CTS Knights Inc.: Sandwich, Ill.
75382	Kulka Electric Corporation: Mt. Vernon, N.Y.
75818	Lenz Electric Mfg. Co.: Chicago, Ill.
75915	Littlefuse, Inc.: Des Plaines, Ill.
76005	Lord Mfg. Co.: Erie, Pa.
76210	C. W. Marwedel: San Francisco, Calif.
76433	General Instrument Corp., Micamold Division: Newark, N.J.
76487	James Millen Mfg. Co., Inc.: Malden, Mass.
76493	J. W. Miller Co.: Los Angeles, Calif.
76530	Cinch-Monadnock, Div. of United Carr Fastener Corp.: San Leandro, Calif.
76545	Mueller Electric Co.: Cleveland, Ohio
76703	National Union: Newark, N.J.
76854	Oak Manufacturing Co.: Crystal Lake, Ill.
77068	The Bendix Corp., Electrodynamics Div.: N. Hollywood, Calif.
77075	Pacific Metals Co.: San Francisco, Calif.
77221	Phanostran Instrument and Electronic Co.: South Pasadena, Calif.
77252	Philadelphia Steel and Wire Corp.: Philadelphia, Pa.
77342	American Machine & Foundry Co. Potter & Brumfield Div.: Princeton, Ind.
77630	TRW Electronic Components Div.: Camden, N.J.
77638	General Instrument Corp., Rectifier Div.: Brooklyn, N.Y.
77764	Resistance Products Co.: Harrisburg, Pa.
77820	Bendix Corp., Electrical Components Div.: Sidney, N.Y.
77969	Rubbercraft Corp. of Calif.: Torrance, Calif.
78189	Shakeproof Division of Illinois Tool Works: Elgin, Ill.
78277	Sigma: S. Braintree, Mass.
78283	Signal Indicator Corp.: New York, N.Y.
78290	Struthers–Dunn Inc.: Pitman, N.J.
78424	Speciality Leather Prod. Co.: Newark, N.J.
78452	Thompson-Bremer & Co.: Chicago, Ill.
78471	Tilley Mfg. Co.: San Francisco, Calif.
78488	Stackpole Carbon Co.: St. Marys, Pa.
78493	Standard Thomson Corp.: Waltham, Mass.
78553	Tinnerman Products, Inc.: Cleveland, Ohio
78790	Transformer Engineers: San Gabriel, Calif.
78947	Ucinite Co.: Newtonville, Mass.
79136	Waldes Kohinoor Inc.: Long Island City, N.Y.
79142	Veeder Root, Inc.: Hartford, Conn.
79251	Wenco Mfg. Co.: Chicago, Ill.
79727	Continental-Wirt Electronics Corp.: Philadelphia, Pa.
79963	Zierick Mfg. Corp.: New Rochelle, N.Y.
80031	Mepco Division of Sessions Clock Co.: Morristown, N.J.
80120	Schnitzer Alloy Products Co.: Elizabeth, N.J.
80131	Electronic Industries Association. Any brand Tube meeting EIA Standards: Washington, D.C.
80207	Unimax Switch, Div. Maxon Electronics Corp.: Wallingford, Conn.
80223	United Transformer Corp.: New York, N.Y.
80248	Oxford Electric Corp.: Chicago, Ill.
80294	Bourns Inc.: Riverside, Calif.
80411	Acro Div. of Robertshaw Controls Co.: Columbus, Ohio
80486	All Star Products Inc.: Defiance, Ohio
80509	Avery Label Co.: Monrovia, California
80583	Hammerlund Co., Inc.: Mars Hill, N.C.
80640	Stevens, Arnold, Co., Inc.: Boston, Mass.
80813	Dimco Gray Co.: Dayton, Ohio
81030	International Instruments Inc.: Orange, Conn.
81073	Grayhill Co.: LaGrange, Ill.
81095	Triad Transformer Corp.: Venice, Calif.
81312	Winchester Elec, Div. Litton Ind., Inc.: Oakville, Conn.
81349	Military Specification
81483	International Rectifier Corp.: El Segundo, Calif.
81541	Airpax Electronics, Inc.: Cambridge, Maryland
81860	Barry Controls, Div. Barry Wright Corp.: Watertown, Mass.
82042	Carter Precision Electric Co.: Skokie, Ill.
82047	Sperti Faraday Inc., Copper Hewitt Electric Div.: Hoboken, N.J.
82116	Electric Regulator Corp.: Norwalk, Conn.
82142	Jeffers Electronics Division of Speer Carbon Co.: DuBois, Pa.
82170	Fairchild Camera & Inst. Corp. Space & Defense System Div.: Paramus, N.J.
82209	Maguire Industries, Inc.: Greenwich, Conn.
82219	Sylvania Electric Prod. Inc. Electronic Tube Division: Emporium, Pa.
82376	Astron Corp.: East Newark, Harrison, N.J.
82389	Switchcraft, Inc.: Chicago, Ill.
82647	Metals & Controls Inc. Spencer Products: Attleboro, Mass.
82768	Phillips-Advance Control Co.: Joliet, Ill.
82866	Research Products Corp.: Madison, Wis.
82877	Rotron Mfg. Co., Inc.: Woodstock, N.Y.
82893	Vector Electronic Co.: Glendale, Calif.
83003	Varo, Inc.: Garland Texas
83014	Hartwell Corp.: Los Angeles, Calif.
83058	Carr Fastener Co.: Cambridge, Mass.
83086	New Hampshire Ball Bearing, Inc.: Peterborough, N.H.
83125	General Instrument Corp., Capacitor Div.: Darlington, S.C.
83148	ITT Wire and Cable Div.: Los Angeles, Calif.
83186	Victory Eng. Corp.: Springfield, N.J.
83298	Bendix Corp., Red Bank Div.: Red Bank, N.J.
83315	Hubbell Corp.: Mundelein, Ill.
83324	Rosan Inc.: Newport Beach, Calif.
83330	Smith, Herman H., Inc.: Brooklyn, N.Y.
83332	Tech Labs: Palisade's Park, N.J.
83385	Central Screw Co.: Chicago, Ill.
83501	Gavitt Wire and Cable Co. Div. of Amerace Corp.: Brookfield, Mass.
83594	Burroughs Corp. Electronic Tube Div.: Plainfield, N.J.
83740	Union Carbide Corp. Consumer Prod. Div.: New York, N.Y.
83777	Model Eng. and Mfg., Inc.: Huntington, Ind.
83821	Loyd Scruggs Co.: Festus, Mo.
83942	Aeronautical Inst. & Radio Co.: Lodi, N.J.
84171	Arco Electronics Inc.: Great Neck, N.Y.
84396	A. J. Glesener Co., Inc.: San Francisco, Calif.
84411	TRW Capacitor Div.: Ogallala, Neb.
84970	Sarkes Tarzian, Inc.: Bloomington, Ind.
85454	Boonton Molding Company: Boonton, N.J.

LIST OF MANUFACTURERS (Continued)

Code No.	Manufacturer/Address
85471	A. B. Boyd Co.: San Francisco, Calif.
85474	R. M. Bracamonte & Co.: San Francisco, Calif.
85660	Koiled Kords, Inc. : Hamden, Conn
85911	Seamless Rubber Co.: Chicago, Ill.
86174	Fafnir Bearing Co.: Los Angeles, Calif.
86197	Cilfton Precision Products Co., Inc.: Clifton Heights, Pa.
86579	Precision Rubber Products Corp.: Dayton, Ohio
86684	Radio Corp. of America, Electronic Comp. & Devices Div.: Harrison, N.J.
86928	Seastrom Mfg. Co.: Glendale, Calif.
87034	Marco Industries: Anaheim, Calif.
87216	Philco Corporation (Lansdale Division): Lansdale, Pa.
87473	Western Fibrous Glass Products Co.: San Francisco, Calif.
87664	Van Waters & Rogers Inc.: San Francisco, Calif.
87930	Tower Mfg. Corp.: Providence, R.I.
88140	Cutler-Hammer, Inc.: Lincoln, Ill.
88220	Gould-National Batteries, Inc.: St. Paul, Minn.
88698	General Mills, Inc.: Buffalo, N.Y.
89231	Graybar Electric Co.: Oakland, Calif.
89473	G. E. Distributing Corp.: Schenectady, N.Y.
89665	United Transformer Co.: Chicago, Ill.
90030	United Shoe Machinery Corp.: Beverly, Mass.
90179	U.S. Rubber Co., Consumer Ind. & Plastics Prod. Div.: Passaic, N.J.
90970	Bearing Engineering Co.: San Francisco, Calif.
91146	ITT Cannon Elect., Inc., Salen Div.: Salem, Mass.
91260	Connor Spring Mfg. Co.: San Francisco, Calif.
91345	Miller Dial & Nameplate Co.: El Monte, Calif.
91418	Radio Materials Co.: Chicago, Ill.
91506	Augat Inc.: Attleboro, Mass.
91637	Dale Electronics, Inc.: Columbua, Nebr.
91662	Elco Corp.: Willow Grove, Pa.
91737	Gremar Mfg. Co., Inc.: Wakefield, Mass.
91827	K. F. Development Co.: Redwood City, Calif.
91886	Malco Mfg. Co., Inc.: Chicago, Ill.
91929	Honeywell Inc., Micro Switch Div.: Freeport, Ill.
91961	Nahm-Bros. Spring Co.: Oakland, Calif.
92180	Tru-Connector Corp.: Peabody, Mass.
92367	Elgeet Optical Co. Inc.: Rochester, N.Y.
92607	Tensolite Insulated Wire Co., Inc.: Tarrytown, N.Y.
92702	IMC Magnetics Corp.: Wesbury Long Island, N.Y.
92966	Hudson Lamp Co.: Kearney, N.J.
93332	Sylvania Electric Prod. Inc. Semiconductor Div.: Woburn, Mass.
93369	Robbins & Myers Inc.: Palisades Park, N.J.
93410	Stemco Controls, Div. of Essex Wire Corp.: Mansfield, Ohio
93459	Weinschel Engr. Co., Inc.: Gaithersburg, Md.
93632	Waters Mfg. Co.: Culver City, Calif.
93929	G. V. Controls: Livingston, N.J.
94137	General Cable Corp.: Bayonne, N.J.
94142	Phelps Dodge: Yonkers, N.Y.
94144	Raytheon Co., Comp. Div., Ind. Comp. Operations: Quincy, Mass.
94148	Scientific Electronics Products, Inc.: Loveland, Colo.
94145	Wagner Elect. Corp., Tung-Sol Div.: Newark, N.J.
94197	Curtiss-Wright Corp. Electronics Div.: East Paterson, N.J.
94222	South Chester Corp.: Chester, Pa.
94330	Wire Cloth Products, Inc.: Bellwood, Ill.
94375	Automatic Metal Products Co.: Brooklyn, N.Y.
94682	Worcester Pressed Aluminum Corp.: Worcester, Mass.
94696	Magnecraft Electric Co.: Chicago, Ill.
95023	George A. Philbrick Researchers, Inc.: Boston, Mass.
95146	Alco Electronic Products Inc.: Lawrance, Ma.
95236	Allies Products Corp.: Dania, Fla.
95238	Continental Connector Corp.: Woodside, N.Y.
95263	Leecraft Mfg. Co., Inc.: Long Island, N.Y.
95265	National Coil Co.: Sheridan, Wyo.
95275	Vitramon, Inc.: Bridgeport, Conn.
95348	Gordos Corp.: Bloomfield, N.J.
95354	Methode Mfg. Co.: Rolling Meadows, Ill.
95566	Arnold Engineering Co.: Marengo, Ill.
95712	Dage Electric Co., Inc.: Franklin Ind.
95984	Siemon Mfg. Co.: Wayne, Ill.
95987	Weckesser Co.: Chicago, Ill.
96067	Microwave Assoc., West Inc.: Sunnyvale, Calif.
96095	Hi-Q Div. of Aerovox Corp.: Olean, N.Y.
96156	Thordarson-Meissner Inc.: Mt. Carmel, Ill.
96296	Solar Manufacturing Co.: Los Angeles, Calif.
96306	Microswitch, Div. of Minn.–Honeywell: Freeport, Ill.
96330	Carlton Screw Co.: Chicago, Ill.
96341	Microwave Associates, Inc.: Burlington, Mass.
96501	Excel Transformer Co.: Oakland, Calif.
96733	San Fernando Elect. Mfg. Co.: San Fernando, Calif.
96881	Thomson Ind. Inc.: Long Is., N.Y.
97464	Industrial Retaining Ring Co.: Irvington, N.J.
97539	Automatic & Precision Mfg.: Englewood, N.J.
97979	Reon Resistor Corp.: Yonkers, N.Y.
97983	Litton System Inc., Adler-Westrex Commun. Div.: New Rochelle, N.Y.
98144	R-Tronics, Inc.: Jamaica, N.Y.
98159	Rubber Teck, Inc.: Gardena, Calif.
98220	Hewlett-Packard Co., Moseley Div.: Pasadena, Calif.
98278	Microdot, Inc.: So. Pasadena, Calif.
98291	Sealectro Corp.: Mamaroneck, N.Y.
98376	Zero Mfg. Co.: Burbank, Calif.
98410	Etc. Inc.: Cleveland, Ohio
98731	General Mills Inc., Electronics Div. Minneapolis, Minn.
98734	Paeco Div. of Hewlett-Packard Co.: Palo Alto, Calif.
98821	North Hills Electronics, Inc.: Glen Cove, N.Y.
98978	International Electronic Research Corp.: Burbank, Calif.
99109	Columbia Technical Corp.: New York, N.Y.
99313	Varian Associates: Palo Alto, Calif.
99378	Atlee Corp.: Winchester, Mass.
99515	Marshall Ind., Capacitor Div.: Monrovia, Calif.
99707	Control Switch Division, Controls Co. of America: El Segundo, Calif.
99800	Delevan Electronics Corp.: East Aurora, N.Y.
99848	Wilco Corporation: Indianapolis, Ind.
99928	Branson Corp.: Whippany, N.J.
99934	Renbrandt, Inc.: Boston, Mass.
99942	Hoffman Electronics Corp. Semiconductor Div.: El Monte, Calif.
99957	Technology Instrument Corp. of Calif.: Newbury Park, Calif.

NO SUPPLEMENTS OR ADDENDUMS APPLY TO THIS MANUAL

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